Traditional BMP Implementation in Phases (Iterative Process)

Phase I: Assess Current Practices, Set Goals, Choose Initial Actions for Improvement

In order to improve a Winter Maintenance Program the first step is to try to understand what is currently being done and identify where practices can be improved. Therefore setting a baseline for current practices at a facility will be essential. Once the current operations are understood steps can be taken to improve the processes in order to meet a set goal. Note: The work group has been unable to select an end point goal and this needs to be discussed further. Reporting is not discussed but should be done.

Self-Assessment Worksheet was used to assist in constructing the iterative process for improvement, The 5 fundamental BMPs (Calibration, Measurement, Accountability, Level of Service, and Training), the other 6 BMPs (Variable Application Rates, Forecasts, Cold Temp Usage, Liquid Usage, pre-wetting, and anti-icing) were considered more as practices that can be implemented in order to improve

In Phase I of the assessment current operations should be documented in a Salt Management Plan to include site maps and the following aspects:

1. Define the Service Area
    a. Define areas where winter maintenance occurs (acres, lane miles, storage, etc.)
    b. Define the Level of Service based on locations to be treated (roads, sidewalks, parking)
    c. Define Key personnel and their duties in the overall process (managers, operators, contract, seasonal, etc.)
2. Determine a baseline for application rate control based on current practices (this can potentially be used to determine progress towards the goals set)
    a. Define current Equipment types, Calibration Protocols, and tracking procedures
    b. Define current Salt Application Rates and tracking procedures
    c. Define current Training Program and tracking procedures
3. Determine other operational controls in place for minimizing impact of Chlorides to the environment
    a. Are Liquid Materials used?
    b. Are low or non-chloride measures used?
    c. How is salt being stored?
    d. How are sand/salt mixtures mixed and stored?
    e. How are Liquid Materials Stored?
    f. How are materials handled in the off-seasons?
    g. Is plowing used and when?
4. Use information collected and documented above to assess operations and determine areas for improvement based on the self-assessment worksheet (the goal here would be to have a program where all aspects of the worksheet is rated at the best level of 4)
    a. Identify the categories of the worksheet that the facility rated at below a level of 4 in
    b. For each category rated below a 4 – Identify short term and long term actions that can be taken to improve that particular category. (BMP list/summaries being developed by the workgroup can be used, the fundamental 5 BMPs should be prioritized)
    c. Define a proposed schedule of implementation for each action (BMP) defined in 4.b.

d. Define measurable goals for each action defined in 4.b. (i.e. ensure 100% of equipment is fitted with calibration units by year 5, ensure 100% of personnel are trained annually)

Phase II: Implement Facility Salt Management Plan, Track Progress, Reevaluate

Once current practices are understood and achievable goals are set there should be continuous monitoring, tracking, and reporting of progress. This will ensure accountability on all levels. Additionally, the program should be set up to work with the iterative process since not all sites are equal and not all BMPs will work for all sites.

In Phase II, the Plan and all actions proposed should be evaluated for their effectiveness in reference to the facility and its operations. The following should be evaluated:

1. Service Area
    a. Has the amount to treated surfaces changed?
    b. Has the Level of service changed?
    c. Have Key Personnel changed?
    d. If not established during Phase I:
        i. Develop a Site Map
            1. Areas to be serviced
            2. Environmentally sensitive areas
            3. Snow storage location(s)
            4. Hazard areas
        ii. Develop an inspection/maintenance schedule to identify that can worsen the issue
            1. Drainage issues
            2. Snow storage location(s)
2. Operational Controls
    a. Define Pre-storm planning procedure
        i. Forecasting
        ii. Anti-icing
    b. Define post storm procedure
        i. Weight in/out
        ii. Equipment cleaning/maintenance
        iii. Stockpile maintenance
        iv. Post storm reviews (what worked, what didn't, what can be improved)
    c. Post Winter procedure
        i. Proposed vs Actual application rates
        ii. Areas for Improvement
        iii. Off-season storage
        iv. Equipment improvement
3. Application Rate Control
    a. Equipment and Calibration
        i. Has the type or amount of equipment changed?
        ii. Have any BMPs been implemented as a part of Phase I?
        iii. What is the progress of BMP implementation and has implementation led to improvements?

iv. Have equipment been fitted with additional measures (GPS, chutes, sensors)?
v. If not established during Phase I:
    1. Define when and how equipment should be calibrated
    2. Define what the equipment should be calibrated to
    3. Define how calibration records will be maintained

b. Salt Application Rates
    i. What application rates were achieved during Phase I?
    ii. Have any BMPs been implemented as a part of Phase I?
    iii. What is the progress of BMP implementation and has implementation led to improvements?
    iv. Are/can mechanical techniques like plowing/shoveling used? When does plowing/shoveling occur? How often should plowing/shoveling occur?
    v. Are/can liquid materials used (pre-mixing, pre-wetting, anti-icing)? When will these techniques be used? What concentrations should be used in brine? How will brine be prepared, measured, recorded to ensure proper concentration?
    vi. Have Variable Application Rates been considered or implemented? What will be considered in order to determine the variable rates?
    vii. If not established during Phase I:
        1. Define the maximum/acceptable application rate
        2. Define when salt would be applied
        3. Define when and how application rates can be adjusted
        4. Define what resources would be used in determining application rates such as (precipitation, pavement temp, etc)
        5. Define how and when application rates are tracked (by event, by lane mile, by surface type, etc)
        6. Define how application rates will be tracked (sensors, weight, etc.)

4. Salt Storage and handling
    a. How is salt being stored?
    b. How are sand/salt mixtures mixed and stored?
    c. How are Liquid Materials Stored?
    d. How are materials handled in the off-seasons?
    e. If not established during Phase I:
        i. Develop a storage facility site map detailing
            1. Delivery areas
            2. Loading areas
            3. Mixing areas
            4. Equipment cleaning areas
            5. Stormwater Drainage features
5. Training Program
    a. What level of training was achieved during Phase I (Supervisors, Operators, Both)?
    b. What is the progress of BMP implementation and has implementation led to improvements?
    c. If not established during Phase I:
        i. Define who should be trained
        ii. Types of training required (equipment, operations, record keeping)

iii. Define when and how often training should occur
iv. Define what training materials will be used
v. Define how training or certifications will be tracked/recorded

6. Use information collected and documented above to assess operations and determine areas for improvement based on the self-assessment worksheet (the goal here would be to have a program where all aspects of the worksheet is rated at the best level of 4)
    a. Identify the categories of the worksheet that the facility rated at below a level of 4 in
    b. For each category rated below a 4 – Identify short term and long term actions that can be taken to improve that particular category. (BMP list/summaries being developed by the workgroup can be used, the fundamental 5 BMPs should be prioritized)
    c. Define a proposed schedule of implementation for each action (BMP) defined in 6.b.
    d. Define measurable goals for each action defined in 6.b. (i.e. ensure 100% of equipment is fitted with calibration units by year 5, ensure 100% of personnel are trained annually)
7. Report on progress of BMP implementation and other requirements as defined by other work groups

Phase III: Continual Improvement

Phases I and II should be setting a baseline for daily winter operations and gives both operators and supervisors an idea of how things currently run and common issues that arise. Through annual assessment and reporting on operations, facilities are able to better understand where improvements can be made.

Facilities should consider new ideas in the form of different winter materials, tweaking existing equipment, and trying new strategies. Testing new strategies is a part of the continual improvement process. Although not all strategies attempted will work 100% of the time at all facilities it may still be the best option for others.

It is suggested that facilities, at least annually, go through the evaluation process once winter activities have been concluded. The evaluation should cover the goals set compared to what was actually implemented. Reporting can occur as a presentation of qualitative data collected through the tracking of both material usage and storm data, or through the achievement of goals identified for each BMP.